Amendments to the Specification

[0006] Unfortunately, a gas bearing system requires a minimum gas flow rate which is sufficient to maintain its effectiveness. The gas flow rate through the gas bearing system is an increasing function of piston stroke. Therefore, a minimum piston stroke constraint is imposed on such cryocoolers. Consequently, prior art cryocooler control systems must be designed to confine their range of operation to cooling power outputs between this minimum piston stroke required for gas bearing effectiveness and a maximum piston stroke which avoids damage to the cryocooler. If such a cryocooler encounters operating conditions in which the cooling power demand of the thermal load is less than the cooling power delivered at the minimum piston stroke, the cold finger temperature will not be maintained at the desired set point temperature, but instead will drift to colder temperatures.

[0026] The operation of the apparatus described above illustrates the method of the invention for controlling the temperature of a mass which is cooled by a free piston cryocooler. There are two modes of operation for controlling the temperature of the thermal load. In the first mode, for output cooling power demands requiring a piston stroke exceeding a selected minimum piston stroke, the output cooling power of ~~or~~ the cryocooler is controlled by modulating the piston stroke as an increasing function of the difference between the sensed temperature of the mass being cooled and a command reference input temperature. In the second mode, for output cooling power demands requiring a piston stroke less than the selected minimum stroke, the piston stroke is maintained at the selected minimum stroke and thermal energy is applied to the thermal load.